

Education Discussion Paper

10/79: COMPUTER LITERACY IN THE SCHOOLS OF B.C.



Province of
British Columbia
Ministry of
Education



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EDUCATIONAL COMPUTING

DISCUSSION PAPER 10/79
COMPUTER LITERACY IN THE SCHOOLS OF B.C.

by

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The following is a discussion paper which has evolved from the work presently being conducted by J.E.M. Projects on behalf of the Ministry of Education, Science and Technology. Its purpose is to obtain reaction to the ideas presented.

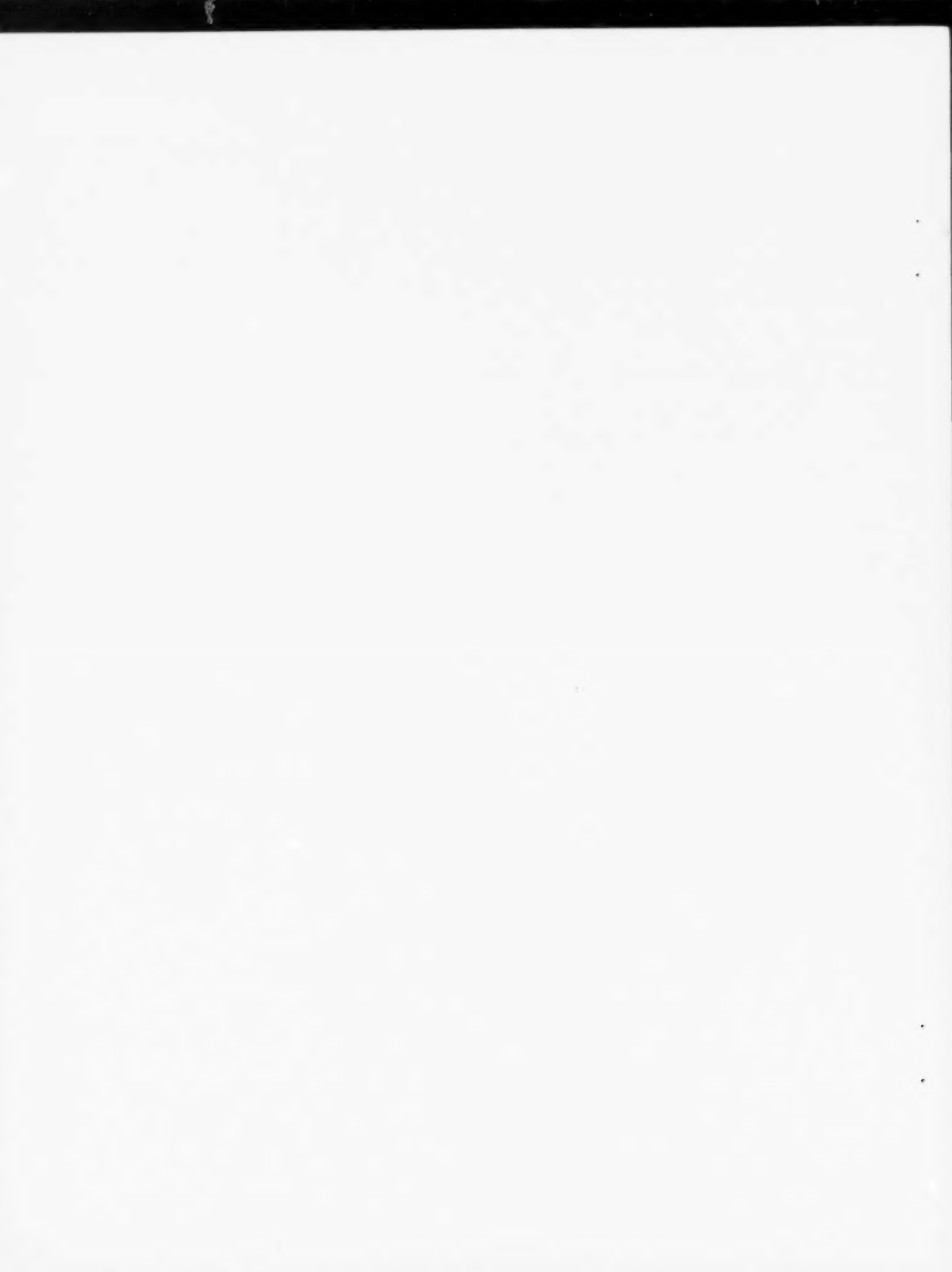
We encourage you to complete, detach and mail this form to the J.E.M. Projects office, Discovery Park, Box 1700, Victoria, B.C. V8W 2Y2, or call Dr. A. E. Wright, Research Director, J.E.M. Projects at (604) 477-7246.

Score along line and detach

Comments:

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1.0 INTRODUCTION

The purpose of this Paper is to promote discussion within the education community on the whole question of computer literacy and how it might be promoted in the schools of the province.

By computer literacy is meant general familiarity and ease with computers, their uses and their application to ordinary, everyday living. Specialized programs for the training of analysts and programmers is not of concern here.

2.0 BACKGROUND

The Conference Board of the Mathematical Sciences reports: "The average citizen hasn't the foggiest idea of how computers work and how pervasive their influence really is. Consequently, he has no idea of what to do when a computer system makes a mistake, he has no idea how to vote on issues involving computers (e.g., national data banks): he is, in short, culturally disadvantaged."

Yet, technology is advancing so rapidly that very shortly a working knowledge of computers will be necessary for us all if we are to function adequately as citizens.

It is only through the education system that computer literacy can be effectively dealt with, but the present use of computers in schools is unwittingly non-supportive of promoting literacy. Although there are notable exceptions, the following generally apply:

- (1) There are only enough teachers and equipment to provide special computer courses at the upper high school level;
- (2) School computers are generally considered to be the province of the high school mathematics department;
- (3) A mythology has developed around computers - they are unfamiliar, difficult and require a special kind of brain power;
- (4) Applications to areas other than mathematics has been limited;
- (5) Because information on new hardware and software applications is not made available to all subject area teachers, there has been little opportunity to be creative in the use of computers in schools.

3.0 THE MECC APPROACH

The Minnesota Educational Computing Consortium, supported by the National Science Foundation, has developed a Computer Literacy Questionnaire for which normative data have been established.

Unlike much of the content in school curricula, the questionnaire is culture-free, that is, the questions reflect the same concerns about computers which are just as true of Canada as they are of the United States, or of Minnesota in particular.

Altogether ninety-seven questions are asked:

- Part I. (48 questions) measures affective goals.
e.g. "I feel uneasy when I am with people who are talking about computers - STRONGLY DISAGREE, DISAGREE, UNDECIDED, AGREE, STRONGLY AGREE."
- Part II. (46 questions) measures cognitive goals.
e.g. "Computers are used to commit crimes - TRUE, FALSE, I DON'T KNOW."

e.g. "The most questionable use of large computer files is: (a) government planning, (b) research, (c) checking on people, (d) administration of social problems, (e) I don't know."

e.g. "Computer software is a term describing:
(a) computer programs, (b) electronic components,
(c) people who work with computers, (d) mechanical and electronic parts of a computer, (e) I don't know."

e.g. "Choose the correct final output for the procedure described below:

1. List the three names Brown, Anderson, Crane in alphabetical order.
2. Remove the last name from the list.
3. If only one name is left, stop. Otherwise, go on to step 4.
4. List the remaining names in reverse order.
5. Go back to step 2.

Output (a) Anderson, Brown, Crane

(b) Brown

(c) Anderson, Brown

(d) Anderson

(e) Crane

Part III. (3 questions) measures programming skills.

e.g. "When run on a computer, the following program will:

1. Input A, B, C, D, E
 2. Let $S = A + B + C + D + E$
 3. Let $M = S/5$
 4. Sprint S, M
 5. End
- a) Calculate the sum of 5 values
 - b) Calculate the average of 5 values
 - c) Print sum & average of 5 values
 - d) All of above
 - e) I don't know."

(The complete questionnaire is appended.)

3.1 GOALS

The goals suggested by such questions are representative of the computer literacy goals prescribed by a wide variety of persons from government, business industry, and higher education. On the basis of student results on this questionnaire, programs are considered successful or not. This questionnaire could be used in British Columbia and the results compared with the normative data base which has been established. (MECC only requests that users share their data). It is obvious from the few questions cited that many sort of things are supposed to result from computer instruction. How computer literate are B.C. students?

The computer literacy goals of MECC are applicable to all parts of the state education system. That is, computer literacy is not considered merely at the level of high school mathematics but at all levels and in all subject areas where computer knowledge may appropriately enhance the program. Computer literacy is the justification for the purchase of four hundred micro computers to use as either "stand alones" or inexpensive terminals, and the intention to purchase many more. With this purchase, the Minnestoa education system is no longer so dependent on time-shared computing.

3.2 OPERATIONS

The Minnesota Educational Computing Consortium makes available hardware and software at bulk discount prices to the state schools. In addition, it services the machines, where possible, from a parts exchange. Combined with the use of the Computer Literacy Questionnaire, MECC has been instrumental in considerably raising the literacy rate in Minnesota.

The micro computers are not considered the particular specialization of one subject or one group of educators. Rather than being content-substantive, they are used as tools to enhance a number of subject areas and to allow learning experiences which were never possible before. Some examples of what has been found possible with other systems and in other regions, illustrates this point.

In Sunnyvale, California, pupils teach other pupils how to program computers. Sunnyvale students also engage in such simulations as "Whale Watching", in which they help a southward-migrating gray whale make the necessary navigational and survival decisions to reach the Baja breeding grounds. One effect of the computer is to create worlds of "If" for children to explore. In Brookline Mass., almost 1.5 million has been spent teaching sixth graders to program computers for math, language, music making and, says Seymour Pappert, "thinking skills". At Dartmouth College, 96% of this year's graduating class use computers which are as freely available as library stacks. Consultant John Nevison says, "Learning to write a computer program must now be considered part of becoming a liberally educated person." In Illinois, a system known as PLATO helps teach 150 subjects ranging from Swahili to rocketry. It's proteges praise PLATO for "kindness" and "personalized attentions".

4.0 COMMENT

A number of questions need to be asked about computer literacy in the schools of British Columbia: - are B.C. students being "left behind" by other regions? Just how should we go about "teaching" computer literacy? How can the first steps be taken?

Joint Educational Management Projects is continuing its investigations into the whole area of school-based computer applications and welcomes reactions, particularly from school personnel.

COMPUTER LITERACY QUESTIONNAIRE

MINNESOTA EDUCATIONAL COMPUTING CONSORTIUM

2520 Broadway Drive

St. Paul, Mn. 55113

Supported by the National Science Foundation. Grant No. SED77-18658

Your Name (please print) _____

Dear Student:

We would appreciate your help by having you answer the questions in this booklet. There are two parts: the first part asks for your opinions and attitudes and the second part is a test of your knowledge about computers. Keep in mind that in the first part (the attitude questions) there are no right answers or wrong answers; just select the answer that best expresses how you feel. In the second part (the computer knowledge test) there may be items you have not yet learned. Just answer as many as you can. Keep in mind that the right answer is the best choice for each question.

Thank You.

This questionnaire developed by:

Ronald E. Anderson

Thomas P. Hansen

David C. Johnson

Daniel L. Klassen

	STRONGLY DISAGREE	DISAGREE	UNDECIDED	AGREE	STRONGLY AGREE
	a	b	c	d	e
9. I feel uneasy when I am with people who are talking about computers.....	a	b	c	d	e
10. I enjoy working with computers.....	a	b	c	d	e
11. I feel confident about my ability to use computers.....	a	b	c	d	e
12. It is my guess that I am <u>not</u> the kind of person who works well with computers.....	a	b	c	d	e
13. On the whole, I can cope with computers in my daily living.....	a	b	c	d	e
14. I am able to work with computers as well as most others my age.....	a	b	c	d	e
15. Computers are gaining too much control over people's lives.....	a	b	c	d	e
16. In general, females can do just as well as males in computer careers.....	a	b	c	d	e
17. More females than males have the ability to become computer specialists.....	a	b	c	d	e
18. Using computers is more for males than for females.....	a	b	c	d	e
19. Studying about computers is just as important for females as for males.....	a	b	c	d	e
20. Men make better scientists and engineers than women do.....	a	b	c	d	e
21. Falsifying information in computers is a serious crime.....	a	b	c	d	e
22. Access to personal information in computer files is a serious problem.....	a	b	c	d	e
23. Organizations should <u>not</u> be allowed to create secret computer files containing detailed information regarding people's personal lives.....	a	b	c	d	e
24. Because of computerized information files, too many people have information about other people.....	a	b	c	d	e

25. To protect people's privacy it is necessary to have laws regarding computer files that contain personal data.....
26. Every secondary school student should have some minimal understanding of computers.....
27. Every secondary school student should be able to write a simple program.....
28. Every secondary school student should learn about the role that computers play in our society.....
29. Computers can be a useful instructional aid in many subject areas other than mathematics.....
30. Computers provide more disadvantages than advantages in education.....

	STRONGLY DISAGREE	DISAGREE	UNDECIDED	AGREE	STRONGLY AGREE
	a	b	c	d	e
25. To protect people's privacy it is necessary to have laws regarding computer files that contain personal data.....	a	b	c	d	e
26. Every secondary school student should have some minimal understanding of computers.....	a	b	c	d	e
27. Every secondary school student should be able to write a simple program.....	a	b	c	d	e
28. Every secondary school student should learn about the role that computers play in our society.....	a	b	c	d	e
29. Computers can be a useful instructional aid in many subject areas other than mathematics.....	a	b	c	d	e
30. Computers provide more disadvantages than advantages in education.....	a	b	c	d	e

DIRECTIONS: Indicate whether you think each of the following values is UNIMPORTANT, IMPORTANT, or EXTREMELY IMPORTANT by circling the appropriate letter. Circle "a" if you think the value is UNIMPORTANT. Circle "b" if you think the value is IMPORTANT. Circle "c" if you think it is EXTREMELY IMPORTANT.

As an example, if you think saving money is EXTREMELY IMPORTANT, circle "c" as shown below:

Saving money

a b **c**

31. Freedom
32. World Peace.....
33. Economic Growth.....

	UNIMPORTANT	IMPORTANT	EXTREMELY IMPORTANT
	a	b	c
31. Freedom	a	b	c
32. World Peace.....	a	b	c
33. Economic Growth.....	a	b	c

	UNIMPORTANT	IMPORTANT	EXTREMELY IMPORTANT
	a	b	c
34. Scientific Knowledge.....	a	b	c
35. Privacy.....	a	b	c
36. Technological Advancement.....	a	b	c
37. Computerization.....	a	b	c
38. Efficiency.....	a	b	c
39. Love and Friendship.....	a	b	c
40. Self Respect.....	a	b	c

DIRECTIONS: Below are some adjectives that can be used to describe computers. For each adjective circle the alternative which best expresses how you feel about computers. If you aren't sure how you feel, circle "undecided." As an example, if you feel that computers are very big, then circle as shown here:

a. not big b. big c. very big d. undecided

If you feel that computers are not big, then circle as shown here:

a. not big b. big c. very big d. undecided

Circle one alternative for each of the eight adjectives.

COMPUTERS ARE:

41. a. not personal b. personal c. very personal d. undecided
42. a. not frustrating b. frustrating c. very frustrating d. undecided
43. a. not good b. good c. very good d. undecided
44. a. not humanizing b. humanizing c. very humanizing d. undecided
45. a. not challenging b. challenging c. very challenging d. undecided
46. a. not bad b. bad c. very bad d. undecided
47. a. not impersonal b. impersonal c. very impersonal d. undecided
48. a. not dehumanizing b. dehumanizing c. very dehumanizing d. undecided

PART II

DIRECTIONS: For each of the following questions, circle the letter beside the best answer. If you do not know the answer to a question, do not leave the item blank; circle the letter beside "I don't know." Use the "I don't know" response as little as possible. Use the "I don't know" response only when you don't even have a guess about the best answer. Do NOT leave any item blank that you attempt; either circle the letter beside an answer or "I don't know."

1. Police sometimes use computers to help identify stolen cars.
 - a. true
 - b. false
 - c. I don't know
2. Most hospitals give injections by computer.
 - a. true
 - b. false
 - c. I don't know
3. Computers cannot be used to assist in teaching English grammar.
 - a. true
 - b. false
 - c. I don't know
4. Computers are not really used very much yet except by scientists.
 - a. true
 - b. false
 - c. I don't know
5. Government officials use computers to store and retrieve large amounts of information about citizens.
 - a. true
 - b. false
 - c. I don't know
6. People often use computers to store large amounts of information they wish to use over and over again.
 - a. true
 - b. false
 - c. I don't know
7. Computers help people make decisions by providing correct answers to any question.
 - a. true
 - b. false
 - c. I don't know

8. Computers help people make decisions by telling them if their problem is important.
 - a. true
 - b. false
 - c. I don't know
9. Computers have been used to make more information and products available to the consumer.
 - a. true
 - b. false
 - c. I don't know
10. Computers are used to commit crimes, especially stealing money and stealing or falsifying information.
 - a. true
 - b. false
 - c. I don't know
11. Identification numbers and passwords are a primary means for restricting undesired access to computer files.
 - a. true
 - b. false
 - c. I don't know
12. Use of computers in education always results in less personal treatment of students.
 - a. true
 - b. false
 - c. I don't know
13. Privacy is an issue with files containing personal information about people.
 - a. true
 - b. false
 - c. I don't know
14. The increased use of computers in our society both eliminates and creates jobs.
 - a. true
 - b. false
 - c. I don't know
15. Almost all people in our society are affected in some way by computers.
 - a. true
 - b. false
 - c. I don't know

16. In order to use a computer you would have to be in the same building as the computer.
 - a. true
 - b. false
 - c. I don't know
17. Computers are able to think in every way just like people.
 - a. true
 - b. false
 - c. I don't know
18. Using computers can free one to do more creative tasks, but this may lead to more dependence upon machines.
 - a. true
 - b. false
 - c. I don't know
19. In order to use any computer you would have to use a telephone.
 - a. true
 - b. false
 - c. I don't know
20. In order to use a computer a person must know how to program.
 - a. true
 - b. false
 - c. I don't know
21. Computers are not good for tasks that require:
 - a. speed
 - b. accuracy
 - c. intuition
 - d. something to be done over and over again
 - e. I don't know
22. If your charge account bill has an error, it was probably caused by:
 - a. breakdown of the computer
 - b. mistakes made by people
 - c. poor design of the computer
 - d. general weaknesses of machines
 - e. I don't know
23. The main duty of a computer programmer is to:
 - a. operate a computer
 - b. prepare instructions for a computer
 - c. schedule jobs for a computer
 - d. design computers
 - e. I don't know

24. The computer related job closest to that of a typist is:
- a. computer operator
 - b. keypunch operator
 - c. systems analyst
 - d. computer programmer
 - e. I don't know
25. Which of the following persons is the most likely to be associated with the design of computers?
- a. keypunch operator
 - b. computer operator
 - c. computer programmer
 - d. computer scientist
 - e. I don't know
26. A basic use of computers in libraries involves:
- a. information storage and retrieval
 - b. simulation and modelling
 - c. process control
 - d. computation
 - e. I don't know
27. A basic use for computers in the design of airplanes is:
- a. simulation and modelling
 - b. process control
 - c. making reservations
 - d. keeping inventory
 - e. I don't know
28. The most questionable use of large computer files is:
- a. government planning
 - b. research
 - c. checking on people
 - d. administration of social programs
 - e. I don't know
29. Which of the following is a limiting consideration for using computers?
- a. cost
 - b. software availability
 - c. storage capacity
 - d. all of the above
 - e. I don't know
30. Which is not a characteristic of most information systems?
- a. a large volume of information is stored and used
 - b. the information is organized
 - c. the basic purpose is to provide reports and summaries of the data
 - d. they contain only alphabetic data
 - e. I don't know

31. The decade of first extensive manufacturing of computers was:

- a. 1860's
- b. 1890's
- c. 1920's
- d. 1950's
- e. I don't know

32. Computer software is a term describing:

- a. computer programs
- b. electronic components encased in soft plastic or rubber
- c. people who work with computers
- d. mechanical and electronic parts of a computer system
- e. I don't know

33. In addition to input and output equipment, computers contain:

- a. terminals, paper, transistors
- b. memory units, control units, arithmetic units
- c. printers and typewriters
- d. telephones, keyboards, television screens
- e. I don't know

34. A computer system is best described as:

- a. processing
- b. programming, input, and output
- c. input and output
- d. input, processing, and output
- e. I don't know

35. The physical parts of a computer are referred to as:

- a. programs
- b. hardware
- c. software
- d. manuals
- e. I don't know

36. When in operation, a computer:

- a. follows a set of instructions written by people
- b. thinks just like a person
- c. recalls answers from memory
- d. translates data from digital to analog code
- e. I don't know

37. Computers cannot run without:

- a. blinking lights
- b. keyboards
- c. instructions
- d. all of the above
- e. I don't know

38. In order to program a computer, a person:
- a. can use any English language words
 - b. can use any English or foreign language words
 - c. must use programming language numbers, not words
 - d. must use the words from a programming language
 - e. I don't know
39. At any given moment, a computer's memory unit can store:
- a. programs
 - b. data
 - c. answers
 - d. all of the above
 - e. I don't know
40. Data processing is best described as:
- a. the collection of data
 - b. producing reports
 - c. manipulating data according to instructions
 - d. using punched cards in a keypunch machine
 - e. I don't know
41. A computer program is a:
- a. course on computers
 - b. set of instructions to control the computer
 - c. computer generated presentation
 - d. piece of computer hardware
 - e. I don't know
42. Computer processing of data may involve:
- a. searching
 - b. summarizing
 - c. deleting
 - d. all of the above
 - e. I don't know
43. The computer must have two types of information to solve a problem:
- a. the problem and the answer
 - b. the name of the program and user number
 - c. the data and the instructions
 - d. the name of the program and your name
 - e. I don't know

44. A newspaper publisher has the following information about subscribers stored in the computer. They are name, address and renewal date. How would you arrange the information to be most useful to the delivery person?

- a. ordered listing by address
- b. ordered listing by renewal dates
- c. alphabetical listing of streets
- d. ordered listing by zip code
- e. I don't know

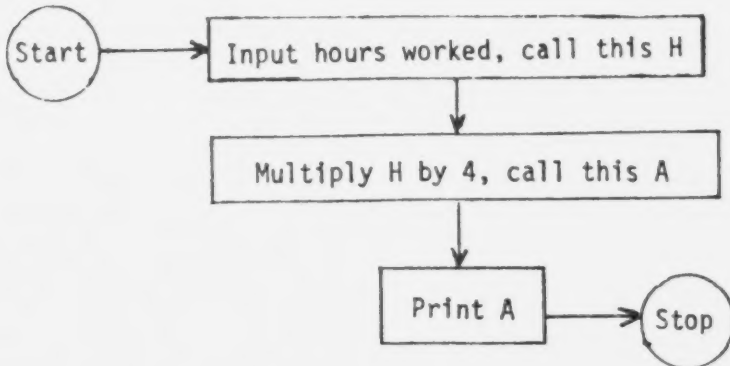
45. Choose the correct output for the procedure described below:

- 1. List the three names Brown, Anderson and Crane in alphabetical order
- 2. Remove the last name from the list
- 3. If only one name is left, stop. Otherwise, go on to step 4
- 4. List the remaining names in reverse order
- 5. Go back to step 2

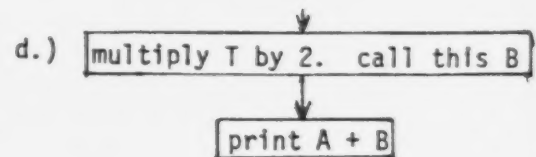
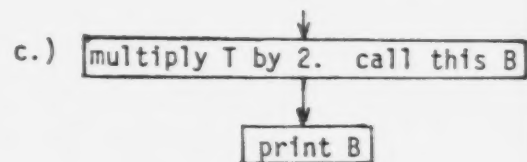
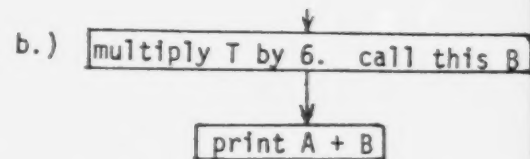
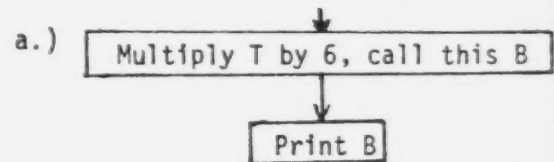
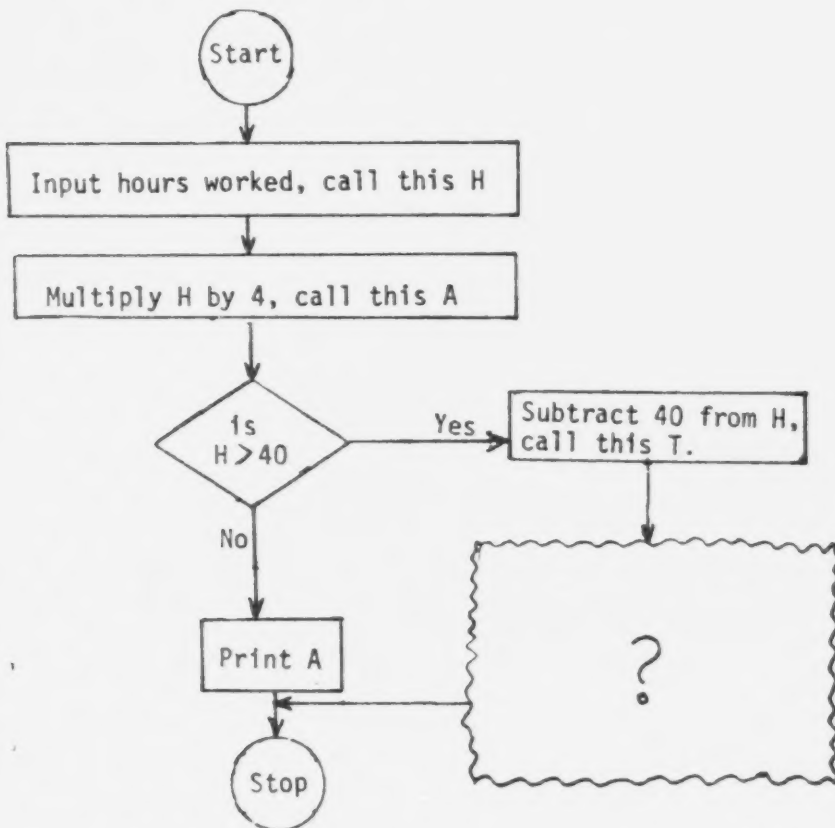
Output

- a. Anderson, Brown, Crane
- b. Brown
- c. Anderson, Brown
- d. Anderson
- e. ~~Anderson, Brown, Crane~~ NONE OF THESE.

46. An algorithm (flowchart) to determine the weekly wages of employees in a bakery is shown below. Employees are paid \$4 per hour up to 40 hours per week.



Employees are also paid "time-and-a-half" (\$6 per hour) for overtime (hours worked over 40). How would you extend the flowchart below to include overtime pay. Select answer a, b, c, d, or e.



e.) I don't know

DIRECTIONS: If you have never written a computer program, STOP: do NOT answer items 1 - 3 below. Answer items 1 - 3 only if you have written a computer program before.

1. Choose the correct output for the computer program shown below:

```
1      LET A = 3
2      LET B = 4
3      LET C = A
4      LET B = C
5      LET A = B
6      PRINT A,B
7      END
```

Output

- a. 3 4
- b. 4 3
- c. 3 3
- d. 4 4
- e. I don't know

2. When run on a computer, the following program will:

```
1      INPUT A, B, C, D, E
2      LET S = A+B+C+D+E
3      LET M = S/5
4      PRINT S,M
5      END
```

- a. Calculate the sum of five input values
- b. Calculate the average of five input values
- c. Print the sum and average of five input values
- d. all of the above
- e. I don't know

3. This program instructs the computer to count by two.

```
10 LET M = 0
20 LET M = M + 2
30 PRINT M
40 IF M < 100 THEN 20
50 END
```

Which change will produce a program which can be used to count by A?
(For example, A=3, 5, or 8.)

- a. 5 READ A
7 DATA 3,5,8
- b. 5 LET M = A
30 PRINT A
- c. 5 INPUT A
20 LET M = M + A
- d. 5 LET X = A
20 LET M = X + A
- e. I don't know